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NOTES ON SOUTH AFRICAN MARINE ALGAE. III.

By George F. Papenfuss.

Study of the South African marine algae has revealed that many of the names which had previously been applied to these plants cannot be maintained. In some instances the accepted name has to be abandoned because it is misapplied, in others because it is a later synonym. Although the primary purpose of the present article is to discuss the identity and the more pertinent nomenclature of certain species, notes of a morphological and distributional nature have been added in so far as it seems desirable to do so at this time. The first two papers in this series are listed in the bibliography.

Grateful acknowledgment is made to the Carnegie Corporation of New York for a Grant-in-aid, received through the University of Cape Town (1939–1940), and to the Guggenheim Foundation for a Fellowship (1949–1950) which made it possible for me to study, in European herbaria, the types and various other published specimens referred to in this paper.

CHLOROPHYCOPHYTA.

Chamaedoris Delphini (Har.) Feldm. et Børg.

Chamaedoris Delphini (Har.) Feldmann et Børgesen, *in* Børgesen, K. Danske Vidensk. Selsk. Biol. Medd. 15 (4): 16, fig. 5, pl. 1, 1940.

Siphonocladus Delphini Hariot, Bull. Mus. Hist. Nat. [Paris] 8: 470, 1902.

Comparison of the South African plant which for a long time has passed as *Chamaedoris annulata* Mont. [or *C. Peniculum* (Ellis et Soland.) O. Kuntze as this taxon should be known] with Børgesen's description of *C. Delphini* has shown that it should be referred to this species. The type locality of *C. Delphini* is Fort-Dauphin, Madagascar. In addition to Madagascar, the species is now known from Mauritius and the east coast of South Africa.

Caulerpa ambigua Okam.

Caulerpa ambigua Okamura, Bot. Mag. Tokyo 11: 4, pl. 1, figs. 3–12, 1897.

In the course of examining preserved material of algae collected by Pocock and Papenfuss in July, 1938, at Umhlali Beach (north of Durban), Dr. Lois Eubank came across specimens of this diminutive species. This constitutes the first record of the occurrence of *Caulerpa ambigua* in

South Africa. Previously the species had been known from the Caribbean, the tropical Pacific, and Mauritius (cf., Eubank 1946; Børgesen 1949).

Børgesen (1949, p. 8) prefers to retain the name *Caulerpa Vickersiae* Børgesen (1911) for this taxon because he ". . . was the first to give a proper description of the species." It is true that Okamura's (1897) description of *C. ambigua* is misleading, but nonetheless it is sufficient to validate this name, which according to the International Rules of Botanical Nomenclature must be retained.

Caulerpa selago (Turn.) C. Ag.

Caulerpa selago (Turn.) C. Agardh, Sp. alg. 1 (2): 442, 1822.

Fucus selago Turner, Fuci 1: 122, pl. 55, 1808.

Chauvinia selago (Turn.) Kützing, Sp. alg.: 497, 1849; Tab. phyc. 7: 5, pl. 11, fig. 1, 1857.

This species is here reported for the first time from South Africa. For a long time it was known only from the Red Sea, but in more recent times it was obtained also in New Guinea (Weber-van Bosse 1898) and the Sulu Archipelago (Weber-van Bosse 1913). The South African plants of *Caulerpa selago* were collected by Pocock and Papenfuss in July, 1938, near the mouth of the St. Lucia Estuary in northern Natal, and agree very well with specimens of this species in Herb. Agardh (No. 16636) which were collected in the Red Sea by Rüppel and published by J. Agardh (1837).

PHAEOPHYCOPHYTA.

Zonaria subarticulata (Lamour.) Papenf.

Zonaria subarticulata (Lamour.) Papenfuss, Farlowia 1: 339, 1944 (excl. syns. *Zonaria Turneriana* J. Ag. and *Phycopteris angustata* Kütz.).

Dictyota subarticulata Lamouroux, Nouv. Bull. Sci. Soc. Philom., sér. 2, 1: 331, 1809 (pro parte); Jour. de Bot. 2: 41, 1809 (pro parte).

Dictyota interrupta Lamouroux, Ann. Mus. Hist. Nat. [Paris] 20: 272, pl. 12. fig. 1. 1813.

Zonaria interrupta (Lamour.) C. Agardh, Sp. alg. 1 (1): 137, 1820 (pro parte).

Zonaria cuneata (Kütz.) Papenfuss, Farlowia 1: 340, 1944.

Phycopteris cuneata Kützing, Tab. phyc. 9: 27, pl. 67, fig. II, 1859.

The identity of *Dictyota subarticulata* has been discussed previously by Papenfuss (1944), who concluded that this name applied to the Australian plant which J. Agardh in 1871 described as *Zonaria Turneriana*—not to the South African species which had passed as *Z. interrupta*. This conclusion was based primarily upon two facts. (1) There was no evidence that either of the two collectors (Thouin and De la Billardière) who had furnished Lamouroux with the material of *D. subarticulata* had visited South Africa, whereas De la Billardière had collected in Australia. (2) In the paper in which Lamouroux (1809*a*) described *Dictyota subarticulata*, he reported upon a number of Australian species, but not a single one from South Africa.

In determining the identity and status of *Dictyota subarticulata* and *D. interrupta* (=*Zonaria interrupta*), three of Lamouroux's publications come up for consideration: 1809*a*, 1809*b*, and 1813. In each of these publications, Lamouroux treats 23 species of *Dictyota*. The names of the species and the sequence in which they are taken up is the same, except that the name of number 7, *Dictyota subarticulata*, as given in the first two publications, is changed to *D. interrupta* in the "Essai" and the locality is here given as "Ind. orient." only instead of "Ind. Or., Nov. Hol." as in 1809. Since *D. subarticulata* or a species resembling it had not been obtained in the East Indies since the time of Lamouroux's writings, Papenfuss suggested that this locality may have been given in error.

Through the kindness of Dr. Roger Meslin and Professor Jean Feldmann, I had the opportunity during the summer of 1950 of examining Lamouroux's material of *Dictyota subarticulata*. According to the notes of Lamouroux which accompany the material, his specimens were supplied by De la Billardière, who had obtained plants at "Cap de Diemen," and by Thouin, who had received specimens from Commerson who had collected them on the coast of Madagascar. It is clear, therefore, that "India orientali" in the sense of Lamouroux applies to Madagascar.

In deciding whether Madagascar or Australia should be regarded as the type locality of *Dictyota subarticulata*, the evidence weighs heavily in favour of Madagascar.

First, the introduction of the name *Dictyota interrupta* by Lamouroux in his "Essai" in 1813, when he gave as locality only "Ind. orient.", probably was an intentional change of name (a relatively common practice in those days which is not sanctioned by present-day rules of nomenclature) rather than an intentional removal of the material from Madagascar to a separate species. As in the case of the other 22 species of *Dictyota*, Lamouroux cited the "Bull. philom." as the place of publication (where he used the name *D. subarticulata*).

Second, Lamouroux's herbarium at present contains only one packet of material under the name *Dictyota subarticulata*, and it is labelled: "inconnu à Linne en 1779. Apporté par Commerson de Madagascar."

Third, Herb. Lamouroux contains a specimen of *Zonaria* from Australia ("N. Holl.") under the names "Dictyota obscura" and "Fu. interruptus Turn." Although there is no proof that this is the material which

Lamouroux had received from De la Billardière, it is evident that Lamouroux had removed the Australian plant to a separate species which he had associated with the plant which Turner (1819) had described and illustrated as *Fucus interruptus.*

On the basis of the information yielded by the material in Herb. Lamouroux, it thus becomes necessary to employ the name *Zonaria subarticulata* (Lamour.) Papenf. for the species from Madagascar; and since this species is conspecific with *Zonaria cuneata* (Kütz.) Papenf., the latter name, which is based upon material from South Africa, must be relegated to synonymy.

Zonaria angustata (Kütz.) Papenfuss, comb. nov.

Phycopteris angustata Kützing, Tab. phyc. 9: 28, pl. 69, fig. 1, 1859.

Zonaria Turneriana J. Agardh, Öfvers. K. Sv. Vetensk.-Akad. Förhandl. 27: 438, 1871; Till alg. syst. [afd. 1]: 48, 1872.

In the discussion of *Zonaria subarticulata* it was pointed out that according to the type specimen this name applies to a species from Madagascar (which also occurs in South Africa). The plant from Australia which has been confused with *Z. subarticulata* (or *Z. interrupta* as the latter has been known for a long time) was first described as an independent species by Kützing (1859) under the name *Phycopteris angustata*, and it is necessary to restore this epithet as *Z. angustata* (Kütz.) Papenf. This species is generally regarded as having a wide distribution in the southern hemisphere, occurring in Tasmania and New Zealand and neighbouring islands in addition to Australia. In connection with his report upon the algae of the Chatham Islands, J. Agardh (1871) described what appears to be the same species as *Z. Turneriana*, and this name was for a long time employed for the plant from the southern seas. The apparent superfluity of this name was already implied by J. Agardh (1872), for he listed *P. angustata* as a synonym of *Z. Turneriana.*

Phyllaria reniformis (Lamour.) Rostaf.

Phyllaria reniformis (Lamour.) Rostafinsky, *in* Bornet, Alg. Schousboe: 250, 1892.

Laminaria reniformis Lamouroux, Ann. Mus. Hist. Nat. [Paris] 20: 42, pl. 7, fig. 3, 1813.

When establishing this species, Lamouroux cited South Africa as the source of his specimens. However, this record was based on a transposition of labels. The species is at home in the western Mediterranean and the Atlantic coasts of southern Europe and North Africa. According to Hamel (1931–1939, p. 308), the specimens of Lamouroux correspond well with plants of *Phyllaria reniformis* from the Mediterranean.

Sargassum heterophyllum (Turn.) C. Ag.

Sargassum heterophyllum (Turn.) C. Agardh, Sp. alg. 1 (1): 21, 1820 (pro parte).
Fucus heterophyllus Turner, Fuci 2: 62, pl. 92, 1809 (pro parte).
Sargassum incisifolium (Turn.) C. Agardh, Sp. alg. 1 (1): 14, 1820.
Fucus incisifolius Turner, Fuci 4: 39, pl. 214, 1819.

The uncertainty concerning the source and the identity of the type material of *Sargassum heterophyllum* was briefly discussed by Papenfuss (1940*b*) in an earlier paper. It was pointed out that the type locality of *Fucus heterophyllus* probably was South Africa despite the fact that when describing the species Turner mentioned only "Coast of Japan" and "Coast of New Holland." The association of the type of *F. heterophyllus* with a species from South Africa was made on the authority of the late Professor Setchell, who had seen Turner's type in the Linnean Herbarium and had identified it with the species from South Africa which J. Agardh (1848) and others had previously referred to *Sargassum heterophyllum.*

During the summer of 1950, I also had an opportunity of examining the type of *Fucus heterophyllus* in the Linnean Herbarium. This specimen (No. 1274–40 of Savage's catalogue, 1945) is named "heterophyllus D. T." and is the one illustrated by Dawson Turner. Although the source of the specimen is not indicated, I concur with the opinion of Setchell that it is representative of a species which is common in South Africa. Concerning the possible identity of the Australian and Japanese plants which Turner referred to *Sargassum heterophyllum*, reference should be made to the article by Papenfuss (1940*b*, p. 9) where Setchell's opinions are stated.

Observations in the field and study of liquid-preserved and dried specimens of *Sargassum incisifolium*, which was described by Turner in 1819 (as *Fucus incisifolius*) on the basis of material from South Africa, has shown that this taxon is conspecific with *S. heterophyllum.* As is often true in *Sargassum*, the plants of *S. heterophyllum* tend to be dioecious, and the male and female receptacles differ in form. The plants which are largely male represent the stage which usually has been assigned to *S. incisifolium* and those which contain largely female conceptacles have usually been referred to *S. heterophyllum.*

RHODOPHYCOPHYTA.

Erythrotrichia Welwitschi (Rupr.) Batt.

Erythrotrichia Welwitschi (Rupr.) Batters, Cat. Brit. mar. alg.: 55, 1902.
Cruoria? *Welwitschi* Ruprecht, Tange Ochotsk. Meeres: 332, pl. 18, fig. i, 1851.

Bangia ciliaris sensu Barton, Jour. Bot. 34: 459, 1896. Non *Bangia ciliaris* Carmichael, *in* Hooker, Brit. fl. 2: 316, 1833=*Erythrotrichia ciliaris* (Carm.) Thuret, *in* Le Jolis, Alg. mar. Cherbourg: 103, 1863.*

An examination of the material, collected by Mrs. Weber-van Bosse at Sea Point (in Ryksherbarium, Leiden), upon which Barton (1896) established the record of *Bangia ciliaris* has shown that it is representative of *Erythrotrichia Welwitschi*. This necessitates the removal of *B. ciliaris* from the flora of South Africa and the addition of *E. Welwitschi*. The plants of Weber-van Bosse were epiphytic on *Ralfsia*, and I have obtained it on the same host at the Cape Town esplanade and at Kommetjie in the Cape Peninsula.

Erythrotrichia Welwitschi was described by Ruprecht (as *Cruoria? Welwitschi*) incidental to his treatment of *Cruoria pellita* in his "Tange des Ochotskischen Meeres." Ruprecht's material occurred on *Ralfsia* which had been collected by Welwitsch at Lisbon, Portugal. He pointed out (correctly as we now know) that *Cruoria? Welwitschi* probably belonged at an entirely different place in the system.

Apparently unaware of Ruprecht's species, J. Agardh in 1876 (p. 15) described Welwitsch's plant as *Callithamnion Welwitschii*. (According to J. Agardh, Welwitsch had distributed the plant as *C. Daviesii* under No. 182 of his "Phyc. Lus.") In the same work (p. 12), J. Agardh published another plant of Welwitsch from Portugal ("Wellw. Phyc. Lus. n:o 23") under the name *C. lepadicola*, which according to Batters (1902) is synonymous with *Erythrotrichia Welwitschi*.

As is true of the plants from Portugal and South Africa, the material of Batters from the coast of Dorset and the Channel Islands occurred (according to Newton, 1931, p. 243) on *Ralfsia*, and the ones from France and Spain reported upon by Hamel (1924, pp. 13–14, fig. II, 3) likewise occurred on *Ralfsia*. The plants from South Africa like those from Europe are attached by a basal rhizoid which penetrates the tissue of the host.

The only other records of *Erythrotrichia Welwitschi* are those of Smith (1944, p. 163, pl. 36, figs. 1–2) and Doty (1947, p. 159) who reported it from the Pacific coast of North America. According to Doty, the erect filaments in his plants arose from a monostromatic base and the same appears to be true of the material reported upon by Smith. It is not inconceivable that the plants from the Pacific represent a different species.

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*It is to be noted that the binomial *Erythrotrichia ciliaris* is invariably credited to Batters (1900, p. 374). The combination was first made, however, by Thuret (in Le Jolis 1863) on the basis of a plant (*Porphyra Boryana* Montagne, *in* Durieu de Maisonneuve 1846, p. 150) which he misidentified with *Bangia ciliaris* Carmichael. Although Thuret had the wrong plant in hand when he made the transfer, he should, in accordance with ART. 54 of the Rules, be credited with the authorship of *E. ciliaris*.

Chaetangium erinaceum (Turn.) Papenfuss, comb. nov.

Fucus erinaceus Turner, Fuci 1: 55, 56, pl. 26, 1808.

Chaetangium ornatum auct. Non *Fucus ornatus* Linnaeus, Mant. pl., ed. 2: 312, 1771=*Suhria vittata* (L.) J. Agardh ex Endlicher, Gen. pl., suppl. 3: 41, 1843.

This species is well known by the name *Chaetangium ornatum*, but unfortunately this binomial cannot be maintained because the type of the name-bringing synonym, *Fucus ornatus* Linnaeus (1771), is representative of *F. vittatus* Linnaeus (1767, p. 718), which is the basinym of *Suhria vittata* (L.) J. Ag. ex Endl.

Herb. Linnaeus contains three sheets of specimens of the *Fucus vittatus-F. ornatus* complex, numbers 1274–79, 1274–80, and 1274–81 of Savage's catalogue. I have examined these specimens. Sheet 1274–79 contains three specimens and is marked "vittatus" in the hand of Linnaeus. This is the type sheet of *F. vittatus* (=*Suhria vittata*). It is pinned to sheet 1274–80, as it was in Turner's time (1808, p. 144, footnote†). Sheet 1274–80 contains two specimens and is marked "Fucus ornatus" in the hand of Linnaeus. This is the type sheet of *F. ornatus*. Both specimens are of *F. vittatus*. Sheet 1274–81 contains two specimens and is marked "vittatus" in the hand of Linnaeus fil. One of the specimens is *Suhria vittata* and the other is *Chaetangium erinaceum*.

The fact that the type sheets of *Fucus vittatus* and *F. ornatus* are pinned together suggests that Linnaeus himself may have realized that these binomials were based on the same species, and it is obvious that Reichard (1780, p. 580) was aware of the close relationship between these two species when he reduced *F. ornatus* to a variety under *F. vittatus*. Later, following an examination of the material of Linnaeus, Turner (1808, pp. 144, 56) pointed out that Linnaeus had founded *F. ornatus* on plants of *F. vittatus*; but botanists in general have ignored Turner's remarks and have continued to accept the specific name *ornatum* for a species of *Chaetangium* from South Africa. Rudolphi (1831, p. 175) and Suhr (1834, p. 370) are the only authors who have employed the epithet *erinaceus* of Turner (both as *Sphaerococcus erinaceus*) for this plant.

Gelidium micropterum Kütz.

Gelidium micropterum Kützing, Tab. phyc. 18: 21, pl. 59, figs. c-g, 1868.

Gelidium corneum sensu: Harvey, Gen. So. Afr. pl.: 399, 1838; Barton, Jour. Bot. 31: 172, 1893 (as to the Harvey material from Sea Point only). Non *Gelidium corneum* (Huds.) Lamouroux, Ann. Mus. Hist. Nat. [Paris] 20: 129, 1813.

This species was described and illustrated by Kützing from material from South Africa. The type (which I have seen) was communicated by

Hohenacker, but the exact locality in South Africa where the specimens were obtained is not known. In 1876, J. Agardh reduced *Gelidium micropterum,* with a query, to the synonymy of *G. cartilagineum,* where it remained until 1938 when Borgesen revived the name for a plant from India.

Gelidium micropterum bears some resemblance to *G. pristoides* and might be confused with this species, but hardly with *G. cartilagineum,* from which it differs markedly. As will be apparent from Kützing's figures of *G. micropterum* (Tab. Phyc. 18, pl. 59) and *G. pristoides* (*op. cit.,* pl. 65), the former is smaller and its flattened branches lack the marginal serrations characteristic of the latter species.

In general, *Gelidium micropterum* is an inhabitant of the colder, west coast waters of South Africa and serves as the counterpart of *G. pristoides,* which attains its optimum development along the south coast. On the basis of material collected by Professor T. A. Stephenson and his associates, *G. micropterum* is known from various west coast localities including Buffels River (south of Port Nolloth) in the north. Along the southwestern part of the Cape Peninsula and in False Bay, *G. micropterum* and *G. pristoides* overlap in their distribution. According to Stephenson (1944, p. 330) *G. micropterum* extends eastward along the south coast as far as Cape Agulhas. Although the occurrence of this species at Cape Agulhas, or perhaps even east of it, appears entirely possible, I have not had an opportunity of verifying its presence at localities east of False Bay.

In addition to the plants from India which Børgesen (1938, p. 121) assigned to *Gelidium micropterum,* he (1943, p. 7) has referred to it specimens from Mauritius and Reunion. In consideration of the fact that South Africa is the type locality of this species and that it is here essentially an inhabitant of the cold west coast waters, it seems highly probable that the plants dealt with by Borgesen belong to a different species.

Gelidium spinulosum (Ag.) J. Ag.

Gelidium spinulosum (Ag.) J. Agardh, Sp. alg. 2 (2^1): 475, 1852; DeToni, Syll. alg. 4 (1): 155, 1897.

J. Agardh gave South Africa as the source of one of his specimens of *Gelidium spinulosum,* and since that time South Africa has always been included in the list of known localities for this species. J. Agardh's record is based on a small fragment which lies loose in a folded paper in Herb. Agardh. It is labelled, "C. B. Sp. Sph. asper?" Examination of this specimen has revealed that it actually is representative of *G. spinulosum.* Since this species is at home along the Atlantic coasts of Spain and Morocco and in the Canary and Azores Islands, and since extensive collecting in recent years has not revealed its occurrence in South Africa, it seems safe to conclude that J. Agardh's record was the result of a transposition of labels.

Gelidiella acerosa (Forssk.) Feldm. et Hamel.

Gelidiella acerosa (Forssk.) Feldmann et Hamel, Rev. Gen. Bot. 46: 533, 1934.

Gelidium rigidum (Vahl) Greville, Alg. brit.: lvii, 1830; Barton, Jour. Bot. 31: 172, 1893.

The majority of South African specimens which various authors have assigned to *Gelidium rigidum* (or *Gelidiella acerosa*, as the species is now known) have been found to belong to *Gelidium Amansii* (Lamour.) Lamouroux (1813). The only exception to this, to my knowledge, is the specimen upon which the record of Barton is based. With a query, Barton (1893, p. 172) referred to *Gelidium rigidum* a specimen in the herbarium of the British Museum and commented: "This specimen is too fragmentary to identify with accuracy." The specimen is labelled "Sphaerococcus spinosus Ag. C. B. Spei," in a hand unknown to me, and "Gelidium rigidum Grev." in Barton's hand. Examination of the specimen has revealed that it actually is representative of *Gelidiella acerosa*. Despite the extensive collecting of recent years no plants of this species have been obtained in South Africa. It seems highly probable, therefore, that the specimen referred to by Barton was not collected in South Africa, and for the present it seems best to exclude *G. acerosa* from this flora.

Peyssonelia capensis Mont.

Peyssonelia capensis Montagne, Ann. Sci. Nat., sér. 3, Bot. 7: 177, 1847.

Peyssonelia major Kützing, Sp. alg.: 693, 1849; Tab. phyc. 19: 31, pl. 88, 1869.

The identity of *Peyssonelia capensis* has always been a matter of doubt. Examination of the type (in Herb. Montagne in Mus. Natl. Hist. Nat., Paris), which was collected by Drège at Port Natal, has revealed that it is conspecific with *P. major*, which was based on a specimen collected at Port Natal by Gueinzius. This remarkable plant is common in certain areas along the eastern coast of South Africa and has become comparatively well known in recent times by the name *P. major*.

Gracilaria Beckeri (J. Ag.) Papenfuss, comb. nov.

Tyleiophora Beckeri J. Agardh, Till. alg. syst. (afd. 6): 36, 1890.

Tylotus Beckeri (J. Ag.) Kylin, Florideenordn. Gigartinales: 60, fig. 17 a-b, pl. 22, fig. 55, 1932.

On the basis of material from South Africa, J. Agardh established the new genus and species *Tyleiophora Beckeri*. *Tyleiophora* agrees in vegetative structure with *Gracilaria* Greville (1830) and the monotypic *Tylotus* J. Agardh (1876). It differs, however, from *Gracilaria* in having its sporangia aggregated in elongated nemathecial sori, instead of scattered over the surface of the thallus, and from *Tylotus* in having cruciately divided instead of zonately divided sporangia.

In studying these genera, Kylin (1932) could not find sporangia in J. Agardh's material of *Tylotus obtusatus* (Sonder) J. Ag., the type of the genus, and concluded that J. Agardh had made an error in reporting zonately divided sporangia in this species. Since *Tylotus* in other respects agreed with *Tyleiophora*, Kylin united these two genera under the name *Tylotus*, which had priority, made the combination *Tylotus Beckeri*, and placed *Tylotus* in the family Gracilariaceae, which he characterized as having cruciately divided sporangia. As a result of Kylin's work our concept of *Tylotus* thus underwent a marked change.

In connection with his study of the Gracilariaceae of the northeastern Pacific, Dawson (1949) examined authentic material of *Tylotus obtusatus* from Western Australia (which he kindly allowed me to see) and found that J. Agardh had been correct in describing the sporangia of this species as zonately divided. In the light of Dawson's observations, it would thus be wrong to unite *Tyleiophora* with *Tylotus*, which, as Dawson pointed out, has to be excluded from the Gracilariaceae. Dawson (*op. cit.*, p. 5) found, furthermore, that: "The genus *Gracilaria*, . . ., contains numerous flat species showing the complete series of gradations from tetrasporangia borne in a completely unmodified cortex to tetrasporangia borne in well-developed nemathecia."

Since *Tyleiophora* as conceived by J. Agardh differs from *Gracilaria* only in having its sporangia in nemathecia and since Dawson has found that in some species of *Gracilaria* the sporangia are localized in nemathecia, it becomes clear that *Tyleiophora* cannot be maintained. The genus is congeneric with *Gracilaria* rather than the related *Gracilariopsis* Dawson (1949) because, as in *Gracilaria*, the gonimoblast of *Tyleiophora Beckeri* produces nutritive filaments which establish connections with cells in the pericarp (*cf.*, Kylin 1932, fig. 17*a*). Such filaments are not produced in *Gracilariopsis*.

Gracilaria capensis Schm. ex Mazza.

Gracilaria capensis Schmitz ex Mazza, Nuova Not. 18: 134, No. 166, 1907.

Tylotus capensis (Schm. ex Mazza) Papenfuss, Bot. Not. 1940: 220, fig. 14, 1940.

Gracilaria denticulata Schm. ex Mazza.

Gracilaria denticulata Schmitz ex Mazza, Nuova Not. 18: 138, No. 172, 1907.

Tylotus denticulatus (Schm. ex Mazza) Papenfuss, Bot. Not. 1940: 221, fig. 15, 1940.

In consideration of the statements made under *Gracilaria Beckeri*, it becomes necessary to return the preceding two species to *Gracilaria*. In characteristic fashion, the gonimoblast in both species produces nutritive filaments which fuse with cells in the pericarp.

It may be noted that Weber-van Bosse (1928), Yamada (1938), and Borgesen (1943) have reported material from Indonesia, the Ryukyu Islands, and Mauritius, respectively, under the name *Gracilaria denticulata* (Kütz.) Schmitz, citing as the name-bringing synonym *Sphaerococcus denticulatus* Kützing (1869). The association by Weber-van Bosse of *S. denticulatus* with *G. denticulata* Schmitz ex Mazza was erroneous for two reasons. First, Mazza published the South African plant as a new species, without reference to *S. denticulatus*. Second, *S. denticulatus* was obtained by Vieillard in New Caledonia, and to judge from Kützing's (1869, pl. 51, fig. e) illustration of its habit, it appears to represent a different species than *G. denticulata* Schmitz ex Mazza.

Whether the material of Weber-van Bosse, Yamada, and Borgesen is in all instances representative of *Sphaerococcus denticulatus* is not certain, but if this species of Kützing should prove to belong to *Gracilaria*, as seems likely from the observations of Weber-van Bosse, it will have to receive another specific name.

Callithamnion gracile Hook. f. et Harv.

Callithamnion gracile Hooker f. et Harvey *in* Hooker, Fl. antarct. 1: 191, pl. 78, fig. 1, 1845.

Dickie (1876, p. 41) and Barton (1893, p. 114) assigned, with doubt, to *Callithamnion gracile* material which had been collected by Moseley in Simons Bay. An examination of this material (in Herb. Mus. Brit.) revealed bryozoan and other animal material, fragments of algae, and sand, but nothing which could be referred to *Callithamnion* or a related genus of algae. It seems best, therefore, to exclude *C. gracile* from the flora of South Africa. Thus far, the species apparently is known only from Campbell Island in the sub-Antarctic.

Ceramium planum Kütz.

Ceramium planum Kützing, Sp. alg.: 687, 1849; Tab. phyc. 13: 5, pl. 11, figs. c-d, 1863.

Ceramium cancellatum C. Agardh, Syst. alg.: 136, 1824; Sp. alg. 2 (1):

145, 1828. Non *Ceramium cancellatum* (L.) DeCandolle, Bull. Sci. Soc. Philom. Paris 3 (94): 264, 1804–1805*.

Pteroceras cancellatum (C. Ag.) Kützing, Sp. alg.: 690, 1849; Tab. phyc. 13: 8, pl. 22, figs. a-b, 1863.

Pteroceras flexuosum Kützing, Sp. alg.: 690, 1849; Tab. phyc. 13: 8, pl. 22, figs. c-e, 1863.

Ceramium flexuosum (Kütz.) Grunow, Alg. Novara: 64, 1867. Non *Ceramium flexuosum* C. Agardh, Syst. alg.: 141, 1824=*Pleonosporium flexuosum* (C. Ag.) Bornet, Alg. Schousboe: 167, 1892.

On the basis of an examination of a photograph and a fragment of the type of *Ceramium flexuosum* (Kütz.) Grunow and a specimen of *C. cancellatum* C. Ag. of Tyson's distribution (No. 85) of South African marine algae, Mazoyer (1938, p. 16) concluded that these two South African taxa were nothing but forms of the same species. An examination of the type specimens of both *C. cancellatum* C. Ag. and *C. flexuosum* (Kütz.) Grunow has convinced me that the observations of Mazoyer were correct. Furthermore, a study of the type of *C. planum* Kützing has shown that this taxon is also representative of the same species. Since *C. cancellatum* C. Agardh (1824) and *C. flexuosum* (Kütz.) Grunow (1867) are later homonyms, the correct name for this species is *C. planum* Kützing.

Ceramium obsoletum C. Ag.

Ceramium obsoletum C. Agardh, Sp. alg. 2 (1): 145, 1828; Kützing, Tab. phyc. 13: 4, pl. 10, figs. a-d, 1863.

Ceramium furcellatum Kützing, Sp. alg.: 687, 1849; Tab. phyc. 13: 4, pl. 11, figs. a-b, 1863; J. Agardh, Sp. alg. 2 (1): 142, 1851. Non *Ceramium furcellatum* (L.) Wiggers, Prim. fl. hols.: 91, 1780=*Furcellaria fastigiata* (L.) Lamouroux, Ann. Mus. Hist. Nat. [Paris] 20: 46, 1813.

Examination of Kützing's type material of *Ceramium furcellatum* has shown that this South African taxon, which has been known only from the description and illustrations of Kützing, is conspecific with *C. obsoletum*.

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*If the nomenclatural history of *Ceramium cancellatum* DC. is traced it is found that this name, as to type, applies to a species of the bryozoan genus *Vesicularia*. Although DeCandolle appears to have had *Halurus equisetifolius* (Lightf.) Kütz. in hand when he made the combination *Ceramium cancellatum*, he gave *Conferva cancellata* Linnaeus (1753) as the basinym of his binomial (*cf.* Roth 1800, pp. 230, 231; C. Agardh 1828, p. 134; Kützing 1849, p. 662; J. Agardh 1851, p. 91). Examination of the second part of the "Species plantarum" (p. 1165) shows that Linnaeus based *Conferva cancellata* upon the *Conferva marina cancellata* of Dillenius (1741, p. 24, pl. 4, fig. 22). In the absence of a specimen under the name *Conferva cancellata* in the Linnean herbarium (*cf.* Savage 1945), this species must be typified with the specimen in the Dillenian herbarium. According to Turner (1804, p. 106) and Druce and Vines (1907, p. 189) this specimen is representative of *Sertularia spinosa* (=*Vesicularia spinosa*). Even though *Ceramium cancellatum* (L.) DeCandolle (1804–1805) is based on an animal, this name, according to ART. 6 of the Rules, retains its status in botanical nomenclature, and hence must be treated as an earlier homonym of *C. cancellatum* C. Agardh (1824).

Reinboldiella Poeppigiana (Grun.) Feldm. et Mazoy.

Reinboldiella Poeppigiana (Grun.) Feldmann et Mazoyer, Bull. Soc. Hist. Nat. Afr. Nord. 28: 213, figs. 1–4, 1937.

Ceramium Poeppigianum Grunow, Alg. Novara: 64, pl. 8, figs. 2a-d, 1867; Barton, Jour. Bot. 34: 195, 1896.

Ceramium prorepens sensu Barton, loc. cit. Non *C. prorepens* Grunow, Alg. Novara: 64, pl. 8, figs. 1a-d, 1867.

An examination of the material upon which Barton established the occurrence of *Ceramium prorepens* in South Africa has shown that her records were based upon *Reinboldiella Poeppigiana. Ceramium prorepens* is accordingly to be excluded from the flora of South Africa.

Taenioma nanum (Kütz.) Papenfuss, comb. nov.

Polysiphonia nana Kützing, Sp. alg.: 879, 1849; Tab. phyc. 13: 10, pl. 29, figs. e-f, 1863. Non *Polysiphonia nana* Harvey *in* Hooker, Fl. nov.-zel. 2: 228, 1855.

Taenioma macrourum Thuret *in* Bornet et Thuret, Notes algol., fasc. 1: 69, pl. 25, 1876.

In a paper on the genus *Taenioma* (Papenfuss 1944a, p. 205) I remarked: "Bornet . . . when uniting *T. perpusillum* and *T. macrourum* listed as a synonym the South African species described by Kützing . . . in 1863 as *Polysiphonia nana*, while Falkenberg . . . gave the latter as a synonym of *T. macrourum.* Kützing figured *P. nana* as having some branches ending in a large inflated apical cell and others ending in two hairs. If *P. nana* were a species of *Taenioma,* it would thus be logical to consider it as representative of *T. macrourum*; and since *nana* is the older specific name it would have priority over *macrourum.* The writer has not had the opportunity of examining Kützing's material nor has he been able to identify with certainty a South African plant with Kützing's species. Judging from Kützing's description and figure, however, there is little reason for believing that *Polysiphonia nana* is representative of the genus *Taenioma.* It seems more likely that the species is a rhodomelaceous alga. The segments show four parallel, vertically elongated, cells of the same length, which suggest pericentral cells as seen in surface view."

I have now had an opportunity of examining the type material of *Polysiphonia nana* Kützing. This material consists of two small mounts—one on mica and the other on paper. The specimens represent the same species and occur intermingled with a cladophoraceous green alga. In the light of Kützing's illustration, it was indeed a surprise to find that his species actually was conspecific with *Taenioma macrourum* Thuret. As is characteristic of *T. macrourum,* the determinate branchlets end in two hairs (cf., Papenfuss 1944*a*, p. 204), and as is true of both the known species of *Taenioma* the determinate branches are flat, consisting of five cells in width, with each of the lateral pericentral cells flanked at the margin by two cells, whose combined length equals that of a pericentral cell. The indeterminate branches are cylindrical, with each of the segments consisting of a central and four pericentral cells. My erroneous conclusion that *Polysiphonia nana* Kützing was representative of a rhodomelaceous alga was owing to Kützing's inaccurate representation of the anatomical structure of his plant. He not only failed to observe that the branches were of two kinds but failed to notice that in some of the branches (the flat determinate ones) the cells along the margin were only half as long as the other cells of the thallus. This latter character is especially important for it furnishes a clear-cut means of separating a delesseriaceous alga with narrow branches from a member of the Rhodomelaceae (cf., Papenfuss 1944*a*, p. 201). Furthermore, Kützing illustrated the branches of the thallus as having four pericentral cells as seen in surface view, whereas only three pericentral cells are actually to be seen in surface view.

In contrast to the specimens of *Taenioma purpusillum* from Hawaii and South Africa which were studied by me in 1944. Kützing's examples of *T. macrourum* show determinate branches with terminal hairs which are more or less inflated along most of their length; and in many branches the greater portion of a hair is shed, leaving a basal stub which somewhat resembles an apical cell. In some instances the development of one of the apical hairs is retarded and the impression is gained that a branch is terminated by only one hair instead of two as is characteristic in *T. macrourum*. However, in the majority of determinate branches of this kind, a rudimentary second hair can be observed and in no instance could it be established with certainty that only one hair had been formed as one might be led to believe from Kützing's figure.

It is to be noted that Kützing in 1863, when he redescribed *Polysiphonia nana* as a new species, had completely overlooked the fact that he had already described the species under this name in 1849 in the "Addenda et Corrigenda" of his "Species algarum." Along with all previous authors, I had also for a long time failed to note this fact and had been under the impression that even if *Polysiphonia nana* Kütz. were conspecific with *Taenioma macrourum* Thuret (*in* Bornet and Thuret 1876) the former epithet would not have priority over the latter, as I believed it had in 1944, because of the existence of the seemingly illegitimatizing homonym *Polysiphonia nana* Harvey (*in* Hooker 1855). The information now at hand, however, makes it necessary to supplant the name *Taenioma macrourum* Thur. with *T. nanum* (Kütz.) Papenf.

Laing (1901, 1926) does not list *Polysiphonia nana* Harvey, which is based on a plant from New Zealand, but if this is an autonomous species (cf. DeToni 1903, p. 888), it will have to receive a new name.

Finally, it is necessary to point out that *Taenioma nanum* should be excluded from the flora of South Africa, for Kützing (1863) made an error in giving South Africa as the source of his material of *Polysiphonia nana*. In his hand, the label accompanying his specimens bears the data: "Polysiphonia nana Kg. Tab. phyc. xiii. 29. Neapel. Naegeli" and the paper on which the one specimen is pressed bears the number "519." Furthermore, in 1849 he had cited as the source of his material: "In sinu neapolitano: cl. Naegeli (519)." *Taenioma purpusillum* is therefore, as far as known, the only representative of this genus in South Africa.

Acrosorium uncinatum (Turn.) Kylin.

Acrosorium uncinatum (Turn.) Kylin, Lunds Univ. Årsskr. N. F. Avd. 2, 20 (6): 78, fig. 61, 1924.

Fucus laceratus var. ζ *uncinatus* Turner, Fuci 1: 151, pl. 68, figs. c-d, 1808.

Nitophyllum uncinatum (Turn.) J. Agardh, Sp. alg. 2 (2^2): 654, 1852.

Following the precendent set by Kylin (1924) in his monograph of the Delesseriaceae, this widely distributed species (which has previously been reported from South Africa) is invariably credited to J. Agardh (1852*b*), who established the binomial *Nitophyllum uncinatum*. J. Agardh himself, however, cited *Fucus laceratus* var. ζ *uncinatus* Turner as the basinym of this binomial. I have seen Turner's type (at Kew) and found it to be representative of *Acrosorium uncinatum* as generally understood. The type was collected by Miss Hill in 1807 at Tenby (Pembroke) in Wales.

Neurymenia fraxinifolia (Mert. ex Turn.) J. Ag.

Neurymenia fraxinifolia (Mert. ex Turn.) J. Agardh, Sp. alg. 2 (3^2): 1135 1863.

Fucus fraxinifolia Mertens ex Turner, Fuci 3: 140, pl. 193, 1811.

This species is here reported for the first time from South Africa. Tetrasporangial plants, with the blades measuring up to 1 cm. in width were collected by Pocock and Papenfuss at Perriers Rocks in the St. Lucia Bay area in July, 1938. I have seen the type of *Neurymenia fraxinifolia* in the herbarium of the University of Copenhagen. This specimen was obtained in the East Indies. *Neurymenia* is a monotypic genus which has an extensive distribution in the Indian and Pacific oceans.

Laurencia Forsteri (Mert. ex Turn.) Grev.

Laurencia Forsteri (Mert. ex Turn.) Greville, Alg. brit.: lii, 1830.

The only record of the occurrence in South Africa of this Australian species is that of Barton (1893, p. 174). This record is based on a single specimen (in Herb. Mus. Brit.) which is labelled "Laurencia Forsteri" in Harvey's hand. The locality is given as "Cape of Good Hope" but the writing is not that of Harvey. The specimen apparently is representative of *L. Forsteri* but it seems reasonably certain that its source was Australia or Tasmania rather than South Africa. No South African specimens named *L. Forsteri* occur in Harvey's herbarium, nor did Harvey in his writings credit South Africa with this species. Furthermore, extensive collecting in recent years has failed to reveal the occurrence of *L. Forsteri* in South Africa.

Laurencia glomerata Kütz.

Laurencia glomerata Kützing, Sp. alg.: 857, 1849; Tab. phyc. 15: 26, pl. 73, figs. a-c, 1865; Kylin, Lunds Univ. Årsskr. N. F. Avd. 2, 34 (8): 24, pl. 8, fig. 22, 1938.

Laurencia virgata (C. Ag.) J. Agardh, Sp. alg. 2 (3^1): 752, 1852; Sp. alg. 3 (1): 653, 1876 (excl. syn. *L. cymosa major* Kütz. and extra-South African records); Yamada, Univ. Calif. Publ. Bot. 16 (7): 208, pl. 8, 1931.

Chondria obtusa ζ virgata C. Agardh, Sp. alg. 1 (2): 343, 1822.

J. Agardh (1852*c*, p. 767) reduced *Laurencia glomerata* to the synonymy of *L. flexuosa*, both of which species were described by Kützing (1849) from plants from South Africa, and at the same time (p. 753) erected *L. glomerata* Suhr ex J. Agardh for a plant from the Caribbean.

Following the reduction of *Laurencia glomerata* Kütz. by J. Agardh, this name either was given, as by DeToni (1903), in the synonymy of both *L. flexuosa* (as to Kützing's original description of *L. glomerata*) and *L. virgata* (as to Kützing's illustration of *L. glomerata* in Tab. phyc. 15, pl. 73) or it was omitted, as by Yamada (1931, pp. 208, 242), from the synonymy of both.

Although Kützing's (1865) illustrations of *Laurencia glomerata* Kütz. (pl. 73) and *L. flexuosa* (pl. 68) clearly show that these two entities are not conspecific. and although J. Agardh's (1852*c*) diagnosis of *L. virgata* (based upon a plant from South Africa) as well as Yamada's (1931, pl. 8, fig. a) illustration of a specimen, in the general herbarium at Paris, which he regarded as an isotype of *L. virgata*, suggest that this entity is conspecific with *L. glomerata* Kütz., the relationship between these two taxa remained uncertain.

This uncertainty was increased when Kylin in 1938 (p. 25) implied that *Laurencia virgata* represented a species distinct from *L. glomerata* Kütz.

Obviously this question could not be settled until the types of both *Laurencia virgata* and *L. glomerata* Kütz. had been examined. This I have been able to do, and in my opinion these names apply to one and the same species.

Laurencia laxa (Turn.) Gaill.

Laurencia laxa (Turn.) Gaillon, Dict. Sci. Nat. [Levrault] 53: 363, 1828; Greville, Alg. brit.: lii, 1830; Endlicher, Gen. pl., suppl. 3: 43, 1843; Harvey, Ner. austr.: 83, 1847; J. Agardh, Sp. alg. 2 (3^1): 770, 1852; Sp. alg. 3 (1): 662, 1876; Barton, Jour. Bot. 31: 174, 1893 (pro parte).

Fucus laxus Turner, Fuci 4: 14, 15, pl. 203, 1819.

Chondria laxa (Turn.) C. Agardh, Sp. alg. 1 (2): 340, 1822; Syst. alg.: 202, 1824.

Laurencia laxa was described and illustrated by Turner (1819, as *Fucus laxus*) on the basis of a specimen, presumably from South Africa, which he received from Robert Brown. Nothing agreeing with *L. laxa* has since been found in South Africa and all subsequent references to this species are based on Turner's account.

In 1838 in his "Genera of South African Plants," Harvey remarked that *Laurencia laxa* was peculiar to the South African coasts and wrote (p. 401): "I have been so fortunate as to find this last [*L. laxa*] bearing fructification (urceoli) which was unknown to Turner at the time his excellent figure and description were published." However, this observation of Harvey applied to *Chondria capensis* (Harv.) Falk., which he at first confused with *L. laxa*, as is shown by his assigning the latter name to specimens of *C. capensis* (to be found in his herbarium at Trinity College and in the Agardhian Herbarium) and by the statement in his "Nereis australis" (1847, p. 86) that *Laurencia* (=*Chondria*) *capensis* was: "A very distinct species, although I formerly confused it with *L; laxa*, a plant I have never seen, . . ." On page 83 of the same work Harvey remarked that *L. laxa* was known to botanists only by the figure and description of Turner.

Despite Harvey's comments of 1847, the confusion of *Laurencia laxa* with *Chondria capensis* persisted to a certain extent, and in DeToni's "Sylloge algarum" (1903, p. 830) *Fucus laxus* and *Chondria laxa* are given as doubtful synonyms of *Chondria capensis*.

Examination of the type of *Laurencia laxa* (in Herb. Mus. Brit.) has convinced me that it is not representative of any of the South African species of *Laurencia*. The source of the specimen probably was Australia, where Robert Brown collected many of the species that were published by Turner.

Laurencia natalensis Kylin.

Laurencia natalensis Kylin, Lunds Univ. Årsskr. N. F. Avd, 34 (8): 24, pl. 8, fig. 21, 1938.

The records of the occurrence in South Africa of *Laurencia hybrida* (DC.) Lenorm. by Barton (1893, p. 174) and Delf and Michell (1921, p. 113) apply to *L. natalensis*. *Laurencia hybrida* is a European species which does not occur in South Africa.

Laurencia distichophylla J. Ag.

Laurencia distichophylla J. Agardh, Sp. alg. 2 (3^1): 762, 1852; Sp. alg. 3 (1): 656, 1876; Alg. nov.-zel. mar.: 26, 1877; Harvey in Hooker, Fl. nov.-zel. 2: 234, 1855; DeToni, Syll. alg. 4 (3): 800, 1903; 6: 373, 1924; Yamada, Univ. Calif. Publ. Bot. 16 (7): 235, 1931.

This species was established by J. Agardh (1852c) upon material in the herbarium of C. Agardh which is marked: "an e Cap. b. Spei (Hb. Ag.)." J. Agardh gave as the habitat of this species, "Hab. in oceano australi?" and thought that the material may have come from South Africa or from the Pacific.

In subsequent accounts of this species, South Africa has usually been given as one of its localities, sometimes with a query (J. Agardh 1876; Yamada 1931) and sometimes without (DeToni 1903, 1924; Yendo 1916; Laing 1926). Examination of the type specimen of *Laurencia distichophylla* (No. 37171 in Herb. Agardh) has revealed, however, that the plant is not representative of any of the South African species of *Laurencia*. The species is probably at home in New Zealand, whence it has been reported by Harvey (in Hooker 1855), J. Agardh (1877) and Laing (1901, 1926); and Lindauer has also distributed it from New Zealand as No. 71 of his "Algae Nova-Zelandicae Exsiccatae."

Yendo (1916) has assigned specimens from Japan to *Laurencia distichophylla*, but since neither Yamada (1931) nor Okamura (1936) accredit this species to the flora of Japan, it may be assumed that the record of Yendo was based on a misidentification. The disposition of *L. distichophylla* sensu Yendo is not apparent from the works of Yamada and Okamura.

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